inciting erosion. This would require iterating an optimal throat flow area, which involves extensive additional testing. Southwestern Corp. prefers not to optimize the throats in the 1H Mill but, wishes to install a new set of throats (having the modified throat dimensions) in an entirely different mill. They believe this would resolve whether the problem seen on H mill is either unique or common for the MPS89G.

Erosion

The higher air velocities associated with the original throats would accelerate short and long term erosion. The short term effect, being erosion of the pulverizer components directly above the throat ports, as seen during the test period. The long term erosion would be in the pulverized coal system by the quartz and pyrites normally removed from the mill through the pyrite system. The accelerated erosion caused by quartz, pyrite and larger coal particles is summarized in an [9]EPRI report. Air velocity and the concentration of erosive particles are cited as primary factors in the erosion of the pulverized coal system.

Maintenance

Throat wear and life expectations were as expected. The reduced throat and ledge cover wear would save IGS $1,446,494 over the life of the plant, see the Appendix C for a full economic evaluation.

SAS

SURE ALLOY STEEL

Fineness

The SAS throats produced obvious degradation in fineness with repeated fineness test failures and the most significant increase of 30 and 50 mesh retainage. The only way to resolve the fineness problem with the SAS throats is to decrease air velocity through the throats, which can only be achieved by lowering the amount of air through the mill. Lowering the total air flow through a mill creates the following concerns:

1. Mass flow through the pulverizer directly affects air velocity through the transport lines. Reducing transport line velocities is not recommended until the burner fire problem is resolved.
2. Changing throat air velocities in the 1H Pulverizer resulted in:
    - increased power consumption

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[9]'The Influence of Flow and Particle Size on Pipework Erosion' - December, 1992. D. Hoadley and T. D. Johnson, CEGB, England

- overgrind
- excessive rejects resulting in air and fuel biases

Any future action to change pulverizer air flows would require extensive manhours to test and optimize.

SAS wants to address the fineness problem by installing their new curved classifier vane. Any more designs with no significant historical operating data in MPS pulverizers are not recommended.

Erosion

The increased amount of coarser coal fines and the higher air velocity increase concerns of long term erosion to the pulverized coal system, described in the Southwestern section. The only short term erosion that could be directly attributed to the SAS throats was found in the mill housing adjacent to the wheel bracket guard.

Maintenance

A reduction of throat and ledge cover maintenance was apparent during the test. The reduced throat and ledge cover wear would save IGS $873,378 over the life of the plant, see the Appendix C for a full economic evaluation.

RECOMMENDATIONS

We do not recommend the Southwestern rotating throats because of the erosion and fineness test results of the original design and the reject problem and increased power consumption of the modified design. The relatively low cost to purchase and maintain the Southwestern throats is insignificant compared to the unit performance penalties incurred by inferior fineness and potential mill biasing requirements.

We do not recommend the SAS rotating throats because of the fineness problem, particularly the 30 and 50 mesh retainage, seen in the 2H Mill since installing the SAS throats. The lower cost to purchase and maintain the SAS throats are insignificant compared to the unit performance penalties incurred by reductions of fineness.

We do not believe the Southwestern and SAS throat problems can be economically resolved, or that a resolution even exists. We believe removing the SAS and Southwestern throats from the IGS pulverizers will resolve the performance concerns addressed in this report and preserve a common future spare parts inventory.

Since this test began, other rotating throat designs have been developed which are currently receiving favorable reviews. We

recommend an evaluation of the new rotating throat designs instead of expending additional work to resolve the Southwestern or SAS rotating throats. The new throat evaluation would consist of:

1. Request a thorough presentation on the new rotating throats with a complete list of current users.
2. Visit a current user to inspect installation and review mill performance.
3. Review rotating throat experience and establish guaranties for:
    - mill and Unit performance
    - mill and pulverized coal system erosion
    - fineness, complete with report on Unit efficiency impact

FYI

INTERMOUNTAIN POWER SERVICE CORPORATION

Engineering Test and Inspection Sheet

Equipment Burners Unit # 1 Test/Inspection Date April 15, 1994
Inspector Garry Christensen, Cecil James Responsible Engineer (Initials)

General Notes:

This outage marks the second year of service for the new Unit 1 burners. All burners are in very good condition with little or no repair worked needed for the second consecutive year. The most common problems now seen are:

Stabilizers: Approximately 11 stabilizers have vanes which are either starting to deform or have deformed beyond functionality. The vanes are overheating and loosing the air foil shape which provides the spin defined by the manufacturer. Exfoliation was found on all surfaces of the stabilizer exposed to the fireball, but not on surfaces shielded from direct radiation, PHOTO 1. This stabilizer problem is more pronounced the higher the burner level. Early stages of this deformation were originally detected during the 1993 outage. H2, H3, and E4 had to be replaced. H4, H5, D4, D5, F3, A3, E2, and E3 have pronounced deformation, which if continues will likely result in these stabilizers being replaced next year. We sent photos of the stabilizers to RJM and requested suggestions on how to mitigate further damage. RJM believes the outer register vanes are closed too far which is causing too much swirl on the outer air. We replied that the outer registers are set at the same positions originally specified by RJM, with the exception where vane adjustments are needed for flame stability. No other immediate solution was offered by RJM. Observations by RJM are attached. We also notice a significant amount of ash retained in the out of service burners. The out of service burners definitely see some kind of backdrafting from the furnace, PHOTO 2.

Throat Sleeves: Some throat sleeves do not have enough retaining clips. As a result, these throat sleeves sag and tend to cord between the existing clips. The sagging is more pronounced along the top third of the throat sleeve and permits air to bypass the outer register vanes.

Outer Registers: The outer registers were found seized up on 13 burners.

Loose Outer Register Shrouds:

Four burners had a portion of the shroud not attached to the outer register backplate. One or two of the plug welds which hold the shroud in place had broken.

Maintenance removed the elbows from the E and D rows to rebuild the disk of each isolation valve. Nozzle thickness was measured to assess erosion at the diffuser while the elbows were off. Original wall thickness was 0.500". At this rate of erosion the burners should have 4 to 5 years of life before needing rotation.

	Left	Right
E6	.488	.382
E5	.453	.425
E4	.565	.544
E3	.465	.538
E2	.399	.545
E1	.448	.484
D6	.492	.473
D5	.432	.459
D4	.483	.475
D3	.350	.486
D2	.455	.510
D1	.432	.418